

CRS Report for Congress

Federal Research and Development Funding: FY2009

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Federal Research and Development Funding: FY2009

Summary

President Bush has proposed total research and development (R&D) funding of \$147.0 billion in his FY2009 budget request to Congress, a \$3.9 billion (2.7%) increase over the estimated FY2008 level of \$143.1 billion. Five federal agencies would receive 92.8% of total federal R&D spending: the Department of Defense (54.8%), Department of Health and Human Services (20.1%), National Aeronautics and Space Administration (7.3%), Department of Energy (7.2%), and National Science Foundation (3.5%). The President's request includes \$29.3 billion for basic research, up \$847 million (3.0%) from FY2008; \$27.1 billion for applied research, down \$1.0 billion (-3.6%); \$84.0 billion for development, up 1.6 billion (1.9%); and \$6.5 billion for R&D facilities and equipment, up \$2.5 billion (61.7%). Congress is to play a central role in defining the nation's R&D priorities, especially with respect to two overarching issues: the extent to which the Federal R&D investment can grow in the context of increased pressure on discretionary spending and how available funding will be prioritized and allocated. A low or negative growth rate in the overall R&D investment may require movement of resources across disciplines, programs, or agencies to address priorities.

The Administration has requested significantly larger percentage increases in the R&D budgets of the three agencies that are part of its American Competitiveness Initiative: the Department of Energy's Office of Science, the National Science Foundation, and the National Institute of Standards and Technology. In 2007, Congress authorized substantial R&D increases for these agencies under the America COMPETES Act (P.L. 110-69). The President's budget would reduce R&D funding for four agencies: the Department of Agriculture, down \$357 million (-15.5%); the Department of Veterans Affairs, down \$76 million (-7.9%); the Department of the Interior, down \$59 million (-8.7%); and the Environmental Protection Agency, down \$7 million (-1.3%).

The FY2009 request includes increases for three multiagency R&D initiatives: the National Nanotechnology Initiative, \$1.53 billion, up \$35 million (2.4%); the Networking and Information Technology R&D program, \$3.57 billion, up \$194 million (5.8%); and the Climate Change Science Program, \$2.01 billion, up \$177 million (9.6%).

For the past two years, federal R&D funding and execution has been affected by mechanisms used to complete the annual appropriations process — the year-long continuing resolution for FY2007 (P.L. 110-5) and the combining of 11 appropriations bills into the Consolidated Appropriations Act, 2008 for FY2008 (P.L. 110-161). For example, FY2008 R&D funding for some agencies and programs is below the level requested by the President and passed by the House of Representatives and the Senate. Completion of appropriations after the beginning of each fiscal year has also resulted in delays or cancellation of planned R&D and equipment acquisition.

The House and the Senate have passed concurrent budget resolutions (H.Con.Res. 312 and S.Con.Res. 70, respectively). Differences remain to be reconciled and approved by both chambers.

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Federal Research and Development Funding: FY2009

Overview

Congress continues to take a strong interest in the health of the U.S. research and development (R&D) enterprise and in providing sustained support for federal R&D activities. The United States government supports a broad range of scientific and engineering research and development (R&D). Its purposes include addressing specific concerns such as national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the scientific and engineering workforce; and strengthening U.S. innovation and competitiveness in the global economy. Most of the research funded by the federal government is in support of specific activities of the federal government as reflected in the unique missions of the funding agencies. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the Internet to communications satellites and defenses against disease.

President Bush has requested \$147.0 billion for R&D in FY2009, a 2.7% increase over FY2008 R&D funding which is estimated to be \$143.1 billion.¹ FY2008 funding is provided through the Defense Appropriations Act, 2008 (P.L. 110-116), signed into law by President Bush on November 13, 2007, and the Consolidated Appropriations Act, 2008 (P.L. 110-161), signed into law on December 26, 2007. P.L. 110-161 provides funding for departments and agencies covered in the eleven appropriations acts on which action had not been completed.

The President's FY2009 proposed R&D increase over the FY2008 funding level is due primarily to funding for the American Competitiveness Initiative (ACI) and an advance appropriation to the Department of Homeland Security (DHS) for acquisition under Project BioShield of medical countermeasures, such as vaccines, against biological terror attacks.² The Office of Management and Budget has classified \$2.175 billion of the DHS advance appropriation as R&D facilities construction in FY2009. Some have questioned the appropriateness of classifying these funds as R&D facilities and equipment since the funds appear to be intended for product acquisition rather than research, development, or facilities construction. This advance appropriation accounts for more than half of the net increase in R&D funding in the President's FY2009 budget request.

Analysis of federal R&D funding is complicated by several factors, including the Administration's omission of Congressionally directed spending from its current year budget request, inconsistency among agencies in the reporting of R&D, and the apparent mis-categorization of some funding in the President's request. As a result of these and other factors, the R&D agency figures reported by OMB (and shown in **Table 1**) may differ somewhat from those agency budget analyses that appear later in this report.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide unique insights.

Agency Perspective. The authorization and appropriations process views federal R&D funding primarily from agency and program perspectives. **Table 1** provides data on R&D by agency for FY2007 (actual), FY2008 (estimate), and FY2009 (request) as reported by OMB. Under the President's FY2009 budget

¹ Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that does not equal or exceed the inflation rate may reduce real purchasing power. For example, if inflation in 2008 exceeds 2.7 %, then the President's R&D funding request for FY2009 may represent a decline in real purchasing power. The Consumer Price Index, a key measure of inflation, rose 2.8% in 2007 and is on a pace to exceed 4% in 2008.

² The Department of Homeland Security Appropriations Act, 2004 (P.L. 108-90), provided funding under Title III, Preparedness and Recovery, in the amount of \$5.593 billion to remain available through FY2013. The act restricts DHS from spending more than \$3.418 billion in fiscal years 2004 through 2008. The balance, \$2.175 billion, will become available for use by DHS in FY2009.

request, five federal agencies would receive 92.8% of total federal R&D funding: the Department of Defense (DOD), 54.8%; the Department of Health and Human Services (DHHS) (primarily the National Institutes of Health), 20.1%; the National Aeronautics and Space Administration (NASA), 7.3%; the Department of Energy (DOE), 7.2%; and the National Science Foundation (NSF), 3.5%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Departments of Agriculture (USDA), Commerce (DOC), Homeland Security, Interior (DOI), and Transportation (DOT), and the Environmental Protection Agency (EPA). In total these departments and agencies account for more than 98% of current and requested federal R&D funding.

The Administration has requested significantly larger percentage increases for the three agencies that are part of its American Competitiveness Initiative (ACI): DOE's Office of Science (up 19% above the estimated FY2008 level), the National Science Foundation (up 14%), and DOC's National Institute of Standards and Technology (NIST) (up 5%). In 2007, Congress authorized substantial R&D increases for these agencies under the America COMPETES Act (P.L. 110-69).³ The President's budget would reduce R&D funding for four agencies: the Department of Agriculture, down \$357 million (-15.5%); the Department of Veterans Affairs, down \$76 million (-7.9%); the Department of the Interior, down \$59 million (-8.7%); and the Environmental Protection Agency, down \$7 million (-1.3%).

Table 1. Federal Research and Development Funding by Agency, FY2007-FY2009
(Budget authority, dollar amount in millions)

Department/Agency	FY2007 Actual	FY2008 Estimate	FY2009 Request	Dollar Change, 2008 to 2009	Percent Change, 2008 to 2009
Agriculture	2,275	2,309	1,952	-357	-15.5
Commerce	1,080	1,113	1,157	44	4.0
Defense	78,329	80,192	80,494	302	0.4
Energy	8,522	9,739	10,558	819	8.4
Environmental Protection Agency	606	557	550	-7	-1.3
Health and Human Services	29,201	29,475	29,480	5	0.0
Homeland Security	1,246	1,143	3,287	2,144	187.6
Interior	604	676	617	-59	-8.7

³ For additional information, see CRS Report RL34328, *America COMPETES Act: Programs, Funding, and Selected Issues*, by Deborah D. Stine.

NASA	9,952	10,436	10,737	301	2.9
National Science Foundation	4,479	4,500	5,201	701	15.6
Transportation	768	823	901	78	9.5
Veterans Affairs	892	960	884	-76	-7.9
Other	1,118	1,140	1,145	5	0.4
TOTAL	139,072	143,063	146,963	3,900	2.7

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2009*, Office of Management and Budget, The White House, February 2008.

Character of Work, Facilities, and Equipment Perspective. Federal R&D funding can also be examined by the character of work (basic research, applied research, and development) it supports, and funding provided for facilities and acquisition of R&D major equipment (see **Table 2**). The President's FY2009 request includes \$29.3 billion for basic research, up \$847 million (3.0%) from FY2008; \$27.1 billion for applied research, down \$1.0 billion (-3.6%); \$84.0 billion for development, up \$1.6 billion (1.9%); and \$6.5 billion for facilities and equipment, up \$2.5 billion (61.7%).

Table 2. Federal Research and Development Funding by Character of Work, Facilities and Equipment, FY2007-FY2009
(Budget authority, dollar amount in millions)

	FY2007 Actual	FY2008 Estimate	FY2009 Request	Dollar Change, 2008 to 2009	Percent Change, 2008 to 2009
Basic research	27,688	28,472	29,319	847	3.0
Applied research	27,130	28,112	27,087	-1,025	-3.6
Development	80,606	82,432	84,013	1,581	1.9
Facilities and equipment	3,648	4,047	6,544	2,497	61.7
TOTAL	139,072	143,063	146,963	3,900	2.7

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2009*, Office of Management and Budget, The White House, February 2008.

Combined Perspective. Combining these perspectives, federal R&D funding can be viewed in terms of each agency's contribution to basic research, applied research, development, and facilities and equipment (see **Table 3**). The

federal government is the largest supporter of basic research (funding an estimated 58.8% of U.S. basic research in 2006),⁴ primarily because the private sector asserts it cannot capture an adequate return on long-term fundamental research investments. The Department of Health and Human Services (primarily DHHS's National Institutes of Health (NIH)) accounts for more than half of all federal funding for basic research.

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 58.9% in 2006, while the federal government accounted for an estimated 33.3%.⁵ Among federal agencies, DHHS is the largest funder of applied research, accounting for nearly half of all federally funded applied research.

Industry also provides the vast majority of funding for development, accounting for an estimated 82.5% in 2006, while the federal government provided an estimated 16.2%.⁶ DOD is the primary federal agency development funder, accounting for 88.5% of total federal development funding in the FY2009 request.

Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2007-FY2009
(Budget authority, dollar amount in millions)

	FY2007 Actual	FY2008 Estimate	FY2009 Request	Dollar Change, 2008 to 2009	Percent Change, 2008 to 2009
Basic Research					
-Health and Human Services	15,646	15,897	15,884	-13	0.0
-National Science Foundation	3,635	3,689	4,336	647	17.5
-Energy	3,123	3,232	3,556	324	10.0
Applied Research					
-Health and Human Services	13,405	13,414	13,424	10	0
-Defense	5,103	5,058	4,245	-813	-16.1
-Energy	2,630	3,513	3,474	-39	-1.1
Development					
-Defense	71,641	73,358	74,393	1,035	1.4

⁴ *Science and Engineering Indicators 2008, Volume 2: Appendix Tables*, National Science Foundation, 2008.

⁵ Ibid.

⁶ Ibid.

-NASA	5,576	5,436	5,731	295	5.1
-Energy	1,973	2,232	2,472	240	10.7
Facilities and equipment					
-Homeland Security	131	147	2,250	2,102	1420.3
-NASA	1,643	1,922	2,175	253	13.2
-Energy	796	762	1,056	294	38.6

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2009*, Office of Management and Budget, The White House, February 2008.

Note: Top funding agencies based on FY2009 request.

Multi-Agency Initiatives Perspective. Federal R&D funding can also be viewed in terms of multi-agency efforts, such as the National Nanotechnology Initiative (see “Multiagency R&D Initiatives” section), and other initiatives, such as the Administration’s American Competitiveness Initiative (ACI).

The ACI was proposed by President Bush in February 2006 as a response to growing concerns about America’s ability to compete in the global marketplace. The \$136 billion ACI proposal included \$50 billion for additional research, science education, and the modernization of research infrastructure from FY2007 through FY2016. These funds were intended to double physical sciences and engineering research in three agencies — NSF, DOE’s Office of Science, and NIST — over ten years.⁷ Congress established authorization levels for FY2008-2010 that would put funding for research at these agencies on track to double in approximately seven years. However, FY2008 research funding provided in P.L. 110-161 for these agencies falls below these doubling targets. Estimated FY2008 funding for ACI research totals \$10.61 billion, an increase of approximately \$350 million (3.5%) over the FY2007 ACI funding level.

In FY2009, President Bush has requested \$12.21 billion in funding for ACI research at NSF, DOE’s Office of Science, and the National Institute of Standards and Technology (including its core research program and facilities), an increase of \$1.6 billion (15.1%) above the estimated FY2008 level of \$10.61 billion.⁸ The NSF funding request for FY2009 is \$6.85 billion, an increase of \$821 million (13.6%)

⁷ The ACI proposes to double “innovation-enabling physical science and engineering research” at the three agencies over ten years, and states that “individual agency allocations remain to be determined.” (*The American Competitiveness Initiative: Leading the World in Innovation*, Office of Science and Technology Policy/Domestic Policy Council, The White House, February 2006.)

⁸ American Competitiveness Initiative Research fact sheet, FY2009 request, Office of Science and Technology Policy, The White House, February 2008.

above the estimated FY2008 level of \$6.03 billion.⁹ The FY2009 request for the DOE Office of Science is \$4.72 billion, \$749 million (18.9%) more than the estimated FY2008 level of \$3.97 billion.¹⁰ FY2009 proposed funding for NIST's core research program and facilities totals \$634 million, an increase of \$33 million (4.5%) above the estimated FY2008 level of \$610 million.¹¹

FY2009 Federal R&D Appropriations Status

As of March 2008, both the House and the Senate have passed concurrent budget resolutions (H.Con.Res. 312 and S.Con.Res. 70, respectively). Differences remain to be reconciled and approved by both chambers. These measures establish broad spending ceilings to guide the work of House and Senate appropriators as they set spending levels for FY2009. Funding for research and development is included within these broad parameters but is not specifically identified. Section 601 of H.Con.Res. 312, titled Sense of the House on the Innovation Agenda and the America COMPETES Act, affirms that the budget resolution supports the efforts of the America COMPETES Act (P.L. 110-69) to provide increased funding for physical sciences research and mathematics, science, and engineering education in support of continued U.S. leadership in innovation, research, and technology.

Effect of FY2007-FY2008 Appropriations Process on R&D

For the past two years, federal R&D funding levels and execution have been affected by mechanisms used to complete the annual appropriations process — the year-long continuing resolution for FY2007 (P.L. 110-5) and the combining of 11 appropriations bills into the Consolidated Appropriations Act, 2008 for FY2008 (P.L. 110-161). For example, FY2008 R&D funding for some agencies and programs is below the level requested by the President, and originally passed by House and Senate appropriations committees.¹² The Department of Energy estimates that cuts in its FY2008 R&D budget for its Office of Science will result in layoffs of 525 personnel at the Stanford Linear Accelerator, Fermi National Accelerator Laboratory, Argonne National Laboratory, and other laboratories and universities.¹³ Completion of the appropriations process after the beginning of the fiscal year may also result in delay, reduction, or cancellation of planned R&D, equipment acquisition, and facilities construction, and may impede the ability of agencies to fully obligate funds ultimately appropriated (see CRS Report RS22774, *Federal Research and*

⁹ Office of Management and Budget website. [<http://www.whitehouse.gov/omb/budget/fy2009/nsf.html>]

¹⁰ Office of Management and Budget website. [<http://www.whitehouse.gov/omb/budget/fy2009/energy.html>]

¹¹ Office of Management and Budget website. [<http://www.whitehouse.gov/omb/budget/fy2009/commerce.html>]

¹² Letter from Secretary of Energy Samuel W. Bodman to Sen. Jeff Bingaman, Chairman, Senate Committee on Energy and Natural Resources, February 4, 2008. [http://energy.senate.gov/public/_files/SignedlettertoSenBingamanrequest0.pdf]

¹³ Ibid.

Development Funding: Possible Impacts of Operating Under a Continuing Resolution, by Dana A. Shea and Daniel Morgan).

The following sections provide analyses of the President's FY2009 R&D and related funding requests for selected Federal agencies and multiagency R&D initiatives. These sections will be updated periodically to include information on appropriations actions taken by Congress.

Multiagency R&D Initiatives

The President's FY2009 budget request provides increased funding for three multiagency R&D initiatives. Funding for the National Nanotechnology Initiative (NNI) is requested in the amount of \$1.53 billion for FY2009, an increase of 2.4% over the estimated FY2008 level of \$1.50 billion (see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent).¹⁴ Under the President's FY2009 budget, the NNI would increase its efforts in fundamental phenomena and processes by \$19.2 million (3.6%); instrument research, metrology, and standards by \$21.1 million (34.9%); environmental, health, and safety by \$17.8 million (30.4%); and nanomanufacturing by \$11.9 million (23.7%). Smaller increases would support major research facilities and instrumentation acquisition (up \$6.9 million, 4.5%) and efforts in education and societal dimensions (up \$1.7 million, 4.4%). Funding would fall by \$27.5 million (-10.8%) for nanomaterials research and by \$15.3 million (-4.5%) for nanoscale devices and systems.

The President is requesting \$3.57 billion in FY2009 funding for the Networking and Information Technology R&D (NITRD) program, an increase of 5.8% above the estimated FY2008 level of \$3.37 billion. The NITRD increase is due primarily to requested funding increases for NSF (up \$159 million, 17.1%) and DOE (up \$58 million, 13.3%).^{15, 16} For additional information, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Funding Issues and Activities*, by Patricia Moloney Figliola.

The administration has proposed \$2.01 billion for the Climate Change Science Program (CCSP), an increase of 9.6% over the estimated FY2008 level of \$1.84

¹⁴ *National Nanotechnology Initiative: Research and Development Funding in the President's FY2009 Budget*, fact sheet, Office of Science and Technology Policy, The White House, February 2008; National Nanotechnology Initiative website.
[\[http://www.nano.gov/html/about/funding.html\]](http://www.nano.gov/html/about/funding.html)

¹⁵ *Analytical Perspectives: Budget of the United States Government, Fiscal Year 2009*, Office of Management and Budget, The White House, 2008.

¹⁶ The NITRD data in OMB's *Analytical Perspectives* include the DOD Defense Information Systems Agency (DISA). According to the NITRD National Coordination Office, DISA's contribution is not included in the FY2009 *Networking and Information Technology Research and Development: Supplement to the President's Budget* report.

billion.¹⁷ (See CRS Report RL33817, *Climate Change: Federal Funding and Tax Incentives*, by Jane A. Leggett). Four agencies account for most of the FY2009 CCSP requested funding increase: NASA (up \$126 million, 11.7%), the National Oceanic and Atmospheric Administration (NOAA) (up \$20 million, 8.3%), DOE (up \$18 million, 14.1%), and NSF (up \$16 million, 7.8%).

Department of Defense (DOD)

Congress supports research and development in the Department of Defense (DOD) through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation primarily supports the development of the nation's future military hardware and software and the technology base upon which those products rely.

Nearly all of what DOD spends on RDT&E is appropriated in Title IV of the defense appropriation bill (see **Table 4**). However, RDT&E funds are also requested as part of the Defense Health Program and the Chemical Agents and Munitions Destruction Program. The Defense Health Program supports the delivery of health care to DOD personnel and their families. Program funds are requested through the Operations and Maintenance appropriation. The program's RDT&E funds support Congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program are requested through the Army Procurement appropriation. The Joint Improvised Explosive Device Defeat Fund also contains additional RDT&E monies. However, the fund does not contain an RDT&E line item as do the two programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which now administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. Typically, Congress has funded all of these programs in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

More recently, RDT&E funds have also been requested and appropriated as part of DOD's separate funding to support what the Bush Administration terms the Global War on Terror (GWOT). Congress has appropriated these funds in response to emergency supplemental requests and under a separate GWOT request. GWOT-related requests/appropriations often include funds for a number of transfer funds. These include the Iraqi Freedom Fund (IFF), the Iraqi Security Forces Fund, the Afghanistan Security Forces Fund, and, more recently, the Mine Resistant and Ambush Protected Vehicle Fund (MRAPVF). Congress typically makes a single appropriation into each of these funds, and authorizes the Secretary to make transfers to other baseline accounts, including RDT&E, at his discretion. A more detailed breakdown of GWOT-related RDT&E funding is given in **Table 5**. Note that while much of these GWOT-related appropriations are distributed to a baseline account, they are accounted for separately.

¹⁷ *Analytical Perspectives: Budget of the United States Government, Fiscal Year 2009*, Office of Management and Budget, The White House, 2008.

For FY2009, the Bush Administration requested \$79.6 billion for DOD's baseline Title IV RDT&E, roughly \$2.5 billion more than Congress appropriated for Title IV in FY2008. The FY2009 requests for RDT&E in the Defense Health Program and the Chemical Agents and Munitions Destruction program were \$194 million and \$269 million, respectively. The Administration also submitted an FY2008 Global War on Terror request (i.e., a supplemental request), which included \$2.9 billion for RDT&E. Congress only partially approved the Administration's FY2008 GWOT request made last year. The Administration hopes to make up the balance of that request this year. The Administration has also suggested that a FY2009 GWOT request may be coming later this year.

Since FY2001, funding for RDT&E in Title IV has increased from \$42 billion to \$77 billion in FY2008. In constant FY2008 dollars, the increase is roughly 58%. Historically, RDT&E funding has reached its highest levels in constant dollars, dating back to 1948.¹⁸ Congress has appropriated more for RDT&E than has been requested, every year, since FY1996.

RDT&E funding can be broken out in a couple of ways. Each of the military services request and receive their own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency), collectively aggregated within the Defensewide account. RDT&E funding also can be characterized by budget activity (i.e., the type of RDT&E supported). Those budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced development) constitute what is called DOD's Science and Technology Program (S&T) and represents the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components (e.g., the Joint Strike Fighter or missile defense systems), for which an operational need has been determined and an acquisition program established. Budget activity 6.7 supports system improvements in existing operational systems. Budget activity 6.6 provides management support, including support for test and evaluation facilities.

S&T funding is of particular interest to Congress since these funds support the development of new technologies and the underlying science. Assuring adequate support for S&T activities is seen by some in the defense community as imperative to maintaining U.S. military superiority. This was of particular concern at a time when defense budgets and RDT&E funding were falling at the end of the Cold War. As part of its 2001 Quadrennial Review, DOD established a goal of stabilizing its base S&T funding (i.e., Title IV) at 3% of DOD's overall funding. Congress has embraced this goal. The FY2009 S&T funding request in Title IV is \$11.5 billion, about \$1.3 billion less than what Congress appropriated for S&T in Title IV in FY2008 (not counting S&T funding requested as part of the GWOT request or S&T's share of the general reduction made to Title IV). Furthermore, the S&T request for

¹⁸ This historical data can be found in DOD's *National Defense Budget Estimates for the FY2008 Budget* (also known as the "Green Book"). Office of the Under Secretary for Defense (Comptroller). March 2007. pp 62-67. See [http://www.defenselink.mil/comptroller/defbudget/fy2008/fy2008_greenbook.pdf]. Last viewed May 10, 2007.

Title IV is approximately 2.2% of the overall baseline DOD budget request (not counting funds for the Global War on Terror), short of the 3% goal. The ability for the Administration to meet its 3% goal has been strained in recent years as the overall Defense budget continues to rise. In the FY2007 defense authorization bill (P.L. 109-364, Sec. 217), Congress reiterated its support for the 3% goal, extended it to FY2012, and stipulated that, if the S&T budget request does not meet this goal, DOD submit a prioritized list of S&T projects that were not funded solely due to insufficient resources.

Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities. DOD is not a large supporter of basic research, when compared to the National Institutes of Health or the National Science Foundation. However, over half of DOD's basic research budget is spent at universities and represents the major contribution of funds in some areas of science and technology (such as electrical engineering and material science). The FY2009 request for basic research (\$1.7 billion) is roughly \$65 million more than what Congress appropriated for Title IV basic research in FY2008. (**CRS Contact: John Motteff.**)

Table 4. Department of Defense RDT&E
(\$ in millions)

	FY2007 Enacted ^d	FY2008 Enacted ^d	FY2009 Request
Title IV - By Account			
Army	11,055	12,127	10,524
Navy	18,674	17,919	19,337
Air Force	24,516	26,255	28,067
Defense Agencies	21,291	20,791	21,499
Dir. Test & Eval	185	180	189
Adjustments improved economic assumptions	-286	-367 ^g	
Total Title IV - By Account ^a	75,435	76,905	79,616
Title IV - By Budget Activity			
6.1 Basic Research	1,552	1,634	1,699
6.2 Applied Research	5,282	5,096	4,245
6.3 Advanced Development	6,494	6,039	5,532
6.4 Advanced Component Development and Prototypes	15,785	15,745	15,774
6.5 Systems Dev. and Demo	19,190	18,321	19,537
6.6 Management Support ^b	4,197	4,274	4,369
6.7 Op. Systems Dev ^c	23,221	26,163	28,461
Adjustments improved economic assumptions	-286	-367 ^g	
Total Title IV - by Budget Activity ^a	75,435	76,905	79,617

	FY2007 Enacted ^d	FY2008 Enacted ^d	FY2009 Request
Tanker Replacement Transfer Fund		150	
Title VI - Other Defense Programs			
Defense Health Program	348 ^e	536	194
Chemical Agents and Munitions Destruction	231	313	269
Title IX			
Additional Appropriations - Global War On Terror (GWOT)	408		
GWOT FY2007 Emergency Supplemental (P.L. 110-28)	1,431 ^f		
Continuing Resolution (P.L. 110-92) and Consolidated Appropriations Act 2008 (P.L. 110-161)		926 ^g	
Grand Total	77,853	78,830	80,080

Sources: FY2007 and FY2008 figures were taken mainly from the defense appropriations act conference reports (H.Rept. 109-676 and H.Rept. 110-434, respectively). The FY2007 Defense Health Program figure was taken from the Revised Continuing Appropriations Resolution 2007 (P.L. 110-5, Chpt. 2. Sec. 20203). The GWOT FY2007 Emergency Supplemental figure was taken from the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act 2007 (P.L. 110-28, Chpts. 1 and 3). The figure for the Continuing Resolution (P.L. 110-92) and the Consolidated Appropriations Act 2008 (P.L. 110-161) was taken from the Office of Secretary of Defense, FY2008 Global War on Terror Pending Request, Exhibits for FY2008, Feb. 2008. Title IV figures for the FY2009 request were taken from RDT&E Programs (R-1) Exhibits, Department of Defense Budget FY2009. The FY2009 RDT&E request for the Defense Health Program was taken from the Operations and Maintenance Exhibit (O-1), Department of Defense Budget FY2009. The FY2009 RDT&E request for the Chemical Agents and Munitions Destruction Program was taken from the Procurement Exhibit (P-1), Department of Defense Budget FY2009.

- a. Total Budget Authority for Account and Budget Activity may not agree due to rounding.
- b. Includes funds for Developmental and Operational Test and Evaluation.
- c. Includes funding for classified programs.
- d. Does not include subsequent rescissions or transfers, unless noted.
- e. Funding for the Defense Health Program in FY2007 was provided in P.L. 110-5 (H.J.Res. 20).
- f. This includes \$1,098 million for GWOT-related baseline RDT&E and \$332 million in additional funding for RDT&E in the Defense Health Program. See **Table 5**, below.
- g. Sec. 8104 of the FY2008 Defense Appropriations Act (P.L. 110-116) required a general reduction to account for improved economic assumptions. RDT&E's designated share was \$367 million. Sec. 8097 of this act also required a general reduction of \$507 million to be taken proportionately from Operations and Maintenance (Title II), Procurement (Title III), and RDT&E (Title IV) to account for contractor efficiencies. The RDT&E's share of this reduction is not counted in this table.
- h. Congress addressed some of the Administration's FY2008 GWOT request in one of the continuing resolutions (P.L. 110-92) which supported government operations in early FY2008 and in the Consolidated Appropriations Act of 2008 (P.L. 110-161). The continuing resolution provided additional funds for the MRAPVF. The Consolidated Appropriations Act provided funds to the IFF, some of which were transferred to RDT&E.

Table 5. Department of Defense RDT&E Associated with the Global War on Terror Funding

(\$ in millions)

	FY2007 Defense Apprns. Title IX (P.L. 109-289) Enacted	FY2007 GWOT Supple- mental (P.L. 110-28) Enacted	Continuing Resolution (P.L.110-92) and Consolidated Apprns. 2008 (P.L. 110-161) Enacted	FY2008 GWOT Pending Request	Possible FY2009 GWOT Request
GWOT-Related Title IV					
By Account					
Army		100	20	163	
Navy	231	299	149	611	
Air Force	37	187	84	1,487	
Defense Agencies	140	513	673	684	
Dir. Test & Eval					
Total Budget Auth.^a	408	1,098	926	2,945	
By Budget Activity					
6.1 Basic Research					
6.2 Applied Research			20	6	
6.3 Advanced Development				25	
6.4 Advanced Component Development and Prototypes		17		228	
6.5 Systems Dev. and Demo		107		514	
6.6 Management Support ^b		2	200	54	
6.7 Op. Systems Dev		973	707	2,121	
Total Budget Auth.^a	408	1,099	927	2,948	
GWOT-Related Other Defense Programs					
Defense Health Program		332			
Grand Total	408	1,431	927		

Sources: The FY2007 Title IX figure is taken from the FY2007 defense appropriations act's conference report (H.Rept. 109-676). The FY2007 GWOT Emergency Supplemental figure was taken from the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act 2007 (P.L. 110-28, Chpts. 1 and 3). The figures for the Continuing Resolution (P.L. 110-92) and the Consolidated Appropriations Act 2008 (P.L. 110-161) and the FY2008 GWOT Pending Request were taken from the Office of Secretary of Defense, FY2008 Global War on Terror Pending Request, Exhibits for FY2008, Feb. 2008.

a. Account vs. Budget Activity Total Obligational Authority numbers may not agree due to rounding.
b. Includes funds for Developmental and Operational Test and Evaluation.

Department of Homeland Security (DHS)

The Department of Homeland Security (DHS) has requested \$1.449 billion for R&D and related programs in FY2009, an 8% increase from FY2008. This total includes \$869 million for the Directorate of Science and Technology (S&T), \$564 million for the Domestic Nuclear Detection Office (DNDO), and \$16 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard (see **Table 6**).

The Directorate of Science and Technology (S&T) is the primary DHS R&D organization. Headed by the Under Secretary for Science and Technology, the directorate performs R&D in several laboratories of its own and funds R&D performed by the national laboratories, industry, universities, and other government agencies. The FY2009 request for the S&T Directorate is 5% above the FY2008 appropriation. A proposed increase of \$18 million for the Explosives program would fund R&D on countering improvised explosive devices (IEDs), with an emphasis on basic research to complement shorter-term R&D being conducted by other agencies. A proposed increase of \$43 million for the Laboratory Facilities program includes \$29 million for startup costs at the National Biodefense Analysis and Countermeasures Center (NBACC) as well as \$14 million for laboratory employee salaries previously budgeted in the Management and Administration account. A proposed \$27 million reduction in the Infrastructure and Geophysical program is largely the result of reducing funding for local and regional initiatives previously established or funded at congressional direction.

Among the issues facing Congress are the S&T Directorate's priorities and how they are set, its relationships with other federal R&D organizations, its budgeting and financial management, and the allocation of its R&D resources to national laboratories, industry, and universities. The directorate announced five new university centers of excellence in February 2008. Some existing centers are expected to be terminated or merged over the next few years to align with the directorate's division structure. For more information, see CRS Report RL34356, *The DHS Directorate of Science and Technology: Key Issues for Congress*.

The Domestic Nuclear Detection Office (DNDO) is the primary DHS organization for combating the threat of nuclear attack. It is responsible for all DHS nuclear detection research, development, testing, evaluation, acquisition, and operational support. The FY2009 request for DNDO is a 16% increase from FY2008. Most of the growth is in the Systems Acquisition account, where an increase of \$68 million for procurement of Advanced Spectroscopic Portals (ASPs) is partly offset by a decrease of \$10 million for the Securing the Cities initiative in the New York City area.

Congressional attention has focused on the testing and analysis DNDO conducted to support its decision to purchase and deploy ASPs, a type of next-generation radiation portal monitor.¹⁹ The Consolidated Appropriations Act, 2008

¹⁹ See, for example, Government Accountability Office, *Combating Nuclear Smuggling: (continued...)*

prohibits full-scale procurement of ASPs until the Secretary of Homeland Security has certified their performance.²⁰ DHS states that it expects the Secretary to make that certification in late FY2008. The relative roles of DNDO and the S&T Directorate in research, development, testing, and evaluation also remain an issue of congressional interest. (CRS Contact: Daniel Morgan.)

Table 6. Department of Homeland Security R&D and Related Programs
(\$ in millions)

	FY2007 Actual	FY2008 Enacted	FY2009 Request
Directorate of Science and Technology^a	1,024	830	869
Management and Administration ^b	135	139	132
R&D, Acquisition, and Operations ^a	889	692	737
<i>Border and Maritime</i>	49	25	35
<i>Chemical and Biological</i>	348	208	200
<i>Command, Control, and Interoperability</i>	75	57	62
<i>Explosives</i>	122	78	96
<i>Human Factors</i>	7	14	12
<i>Infrastructure and Geophysical</i>	92	64	38
<i>Innovation</i>	22	33	45
<i>Laboratory Facilities^b</i>	72	104	147
<i>Test and Evaluation, Standards</i>	25	29	25
<i>Transition^c</i>	30	25	32
<i>Homeland Security Institute^c</i>	—	5	—
<i>University Programs</i>	48	49	44
Domestic Nuclear Detection Office	398	485	564
Management and Administration	30	32	39
Research, Development, and Operations	255	324	334
<i>Systems Engineering and Architecture</i>	30	22	25
<i>Systems Development</i>	97	118	108
<i>Transformational Research and Development</i>	57	96	113
<i>Assessments</i>	29	38	32

¹⁹ (...continued)

Additional Actions Needed to Ensure Adequate Testing of Next Generation Radiation Detection Equipment, GAO-07-1247T, testimony before the House Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, September 18, 2007.

²⁰ P.L. 110-161, Division E, Title IV, under the heading “Systems Acquisition.”

	FY2007 Actual	FY2008 Enacted	FY2009 Request
<i>Operations Support</i>	32	34	38
<i>National Technical Nuclear Forensics Center</i>	10	15	18
Systems Acquisition	114	130	191
<i>Radiation Portal Monitoring Program</i>	107	90	158
<i>Securing the Cities</i>	<1	30	20
<i>Human Portable Radiation Detection Systems</i>	6	10	13
U.S. Coast Guard RDT&E	18	25	16
TOTAL ^a	1,440	1,340	1,449

Source: DHS FY2009 congressional budget justification.

Notes: Totals may not add because of rounding.

- a. The FY2007 total does not include a rescission of \$125 million in prior-year funds enacted by the FY2007 appropriations act (P.L. 109-90).
- b. Funding for the salaries of DHS laboratory employees (\$14 million in FY2008) is transferred from Management and Administration to Laboratory Facilities in the FY2009 request.
- c. Congress appropriated \$5 million for the Homeland Security Institute as a separate line item in FY2008. The FY2009 budget justification incorporates this amount into Transition. The FY2009 request for Transition includes \$5 million for the Homeland Security Institute.

National Institutes of Health (NIH)

The President has requested a relatively flat budget of \$29.165 billion at the program level for NIH for FY2009 (see **Table 7**). The FY2008 level, derived from the Consolidated Appropriations Act, 2008 (P.L. 110-161), totaled \$29.171 billion. The FY2009 request represents a decrease of \$5 million (-0.02%) below the FY2008 program level. The FY2008 appropriation was \$133 million (0.5%) more than the FY2007 program level of \$29.038 billion.

NIH's budget primarily comes from the Departments of Labor, Health and Human Services, and Education, and Related Agencies (Labor/HHS) appropriations bill and the Department of the Interior, Environment, and Related Agencies (Interior/Environment) appropriations bill. Those two bills provide NIH's discretionary budget authority. In addition, NIH receives \$150 million annually that was pre-appropriated in separate funding for diabetes research, and \$8.2 million from an "evaluation transfer" within the Public Health Service (PHS). Conversely, NIH loses part of its appropriation to a transfer to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria. For several years, about \$100 million of the annual NIH appropriation was transferred to the Global Fund. For FY2008, the amount was increased to \$300 million in the President's request, and the final amount of the transfer from the NIH appropriation was \$295 million. The FY2009 budget again proposes a transfer of \$300 million to the Global Fund. In **Table 7**, the total funding available for NIH activities, taking account of add-ons and transfers, is called the

program level. Note, however, that the “NIH program level” cited in the Administration’s budget documents does not reflect the Global Fund transfer.

Congress provided NIH with \$27.1 billion in FY2003, completing a five year doubling of its budget. Since then, the growth rate of NIH funding has fallen. In FY2008, NIH funding was increased by 0.5% above FY2007. The President requested no increase for NIH for FY2009, while the advocates in the research community recommended a 6.5% increase. The projected increase in the inflation index is 3.5% for both FY2008 and FY2009. In inflation-adjusted terms, the FY2008 funding level represents an estimated 11% decrease from FY2003, while the FY2009 request level would be 14% below FY2003.

The agency’s organization consists of the Office of the NIH Director and 27 institutes and centers. The Office of the Director (OD) sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The individual institutes and centers (ICs), each having a focus on particular diseases, areas of human health and development, or aspects of research support, plan and manage their own research programs in coordination with the Office of the Director. As shown in **Table 7**, Congress provides a separate appropriation to 24 of the 27 ICs, to OD, and to a buildings and facilities account. (The other three centers, not included in the table, are funded through the NIH Management Fund, financed by taps on other NIH appropriations.)

Within the FY2009 request, most of the institutes and centers would be approximately level-funded from their FY2008 amounts, receiving increases of 0.1% or 0.2%. Only the National Center for Research Resources (1.0%) and the National Library of Medicine (0.8%) would receive increases greater than 0.5%. The two biggest changes in the request are a 5.6% increase in the Buildings and Facilities account, and a 4.7% drop in funding for the Office of the Director. Many of the laboratories, animal facilities, and office buildings on the NIH campus are aging, and are in need of upgrading to stay compliant with health and safety guidelines and to provide the proper infrastructure for the Intramural Research program. The budget requests \$126 million for Buildings and Facilities, an increase of \$7 million.

The net \$52 million drop in the OD account, from \$1,109 million in FY2008 to \$1,057 million in the request, represents the proposed cancellation of a study combined with increases for several other OD activities. The National Children’s Study was funded at \$111 million in FY2008. It is a long-term (25+ year), multi-agency environmental health study that was mandated by the Children’s Health Act of 2000 (P.L. 106-310). The overall projected cost for the whole study is about \$2.7 billion. Starting with the FY2007 request, when the study moved from the planning phase to the more costly implementation phase, the Administration has proposed each year to end its funding. Congress has continued to support the study.

Proposed increases within the OD account total \$59 million, including a \$38 million increase (7.7%) for the NIH Roadmap initiatives funded through the Common Fund. The NIH Roadmap for Medical Research is a set of trans-NIH research activities designed to support high-risk/high-impact research in emerging areas of science or public health priorities. For FY2009, planned funding for the

Roadmap/Common Fund totals \$534 million, up from \$496 million in FY2008. The other major increase requested for OD is an additional \$19 million (19.9%) for research on medical countermeasures against nuclear, radiological, and chemical threats, increasing that program to \$113 million from \$94 million in FY2008. That is the only significant increase for NIH's biodefense portfolio, which totals \$1,748 million in the President's FY2009 request (up 1.2%).

The NIH's two major concerns in the face of tight budgets are maintaining support of investigator-initiated research through research project grants (RPGs), and continuing to nourish the pipeline of new investigators. Total funding for RPGs, at \$15.5 billion, represents about 53% of NIH's budget. The FY2009 request would support an estimated 38,257 awards, about the same as in FY2008, but with \$19 million less in funding. Within that total, 9,757 would be competing RPGs, 14 fewer than in FY2008. No inflationary increases are proposed for noncompeting (continuation) RPGs, and the average annual cost of competing RPGs would remain at the FY2008 level, about \$361,000. The expected "success rate" of applications receiving funding would decline to about 18% from the estimated rate of 19% for FY2008. Estimated success rates for the various ICs would range from 8% to 26%.

Several efforts are focused on supporting new investigators to encourage young scientists to undertake careers in research and to help them speed their transition from training to independent research. The Pathway to Independence program would support approximately 500 awardees, including 170 new awards, for a total of \$71 million. Regular training mechanisms such as the National Research Service Awards are proposed for an increase of \$5 million (0.6%) to \$786 million, including stipend increases of 1% for both pre- and post-doctoral fellows. Clinical research training, including the Clinical and Translational Science Awards, would be funded at a total of \$475 million. The request would support about 25 New Innovator Awards for a total of \$56 million in the Common Fund. The NIH Director's Bridge Award is a program that can give short-term funding to established, meritorious investigators who have just missed the funding cutoff for a renewal application and who have little other support, giving them time to resubmit without disrupting the operation of their laboratory. The request includes \$91 million for 244 awards, an increase of \$1.6 million.

Changes proposed in the request for other funding mechanisms within the NIH budget include increased support for research centers, up \$20 million to \$2,963 million; a \$33 million increase to \$3,275 million for R&D contracts, including \$5 million additional for the Global HIV/AIDS Fund; \$50 million more for the NIH intramural research program, for a total of \$3,119 million; an increase of \$20 million to a total of \$1,361 million for research management and support; and a decrease of \$23 million for other research grants totaling \$1,786 million.

NIH and three of the other Public Health Service agencies within HHS are subject to a budget "tap" called the PHS Program Evaluation Set-Aside (Section 241 of the PHS Act), which has the effect of redistributing appropriated funds among PHS and other HHS agencies. The FY2008 appropriation kept the tap at 2.4%, the same as in FY2007. NIH, with the largest budget among the PHS agencies, becomes the largest "donor" of program evaluation funds, and is a relatively minor recipient.

By convention, budget tables such as **Table 7** do not subtract the amount of the evaluation tap, or of other taps within HHS, from the agencies' appropriations.

At the end of the 109th Congress, the House and Senate agreed on the first NIH reauthorization statute enacted since 1993, the NIH Reform Act of 2006 (P.L. 109-482). The law made managerial and organizational changes in NIH, focusing on enhancing the authority and tools for the NIH Director to do strategic planning, especially to facilitate and fund cross-institute research initiatives. The measure authorized, for the first time, overall funding levels for NIH, although not for the individual ICs, and established a "common fund" for trans-NIH research. For further information on NIH, see CRS Report RL33695, *The National Institutes of Health: Organization, Funding, and Congressional Issues*, by Pamela W. Smith. (**CRS Contact: Pamela Smith.**)

Table 7. National Institutes of Health
(\$ in millions)

Institutes and Centers (ICs)	FY2007 actual ^a	FY2008 enacted ^b	FY2009 request
Cancer (NCI)	4,795.5	4,805.1	4,809.8
Heart/Lung/Blood (NHLBI)	2,919.2	2,922.1	2,924.9
Dental/Craniofacial Research (NIDCR)	389.8	390.2	390.5
Diabetes/Digestive/Kidney (NIDDK)	1,706.0	1,706.7	1,708.5
Neurological Disorders/Stroke (NINDS)	1,534.9	1,543.9	1,545.4
Allergy/Infectious Diseases (NIAID) ^{c,d}	4,366.4	4,560.7	4,568.8
General Medical Sciences (NIGMS)	1,935.6	1,935.8	1,937.7
Child Health/Human Development (NICHD)	1,254.1	1,254.7	1,255.9
Eye (NEI)	666.7	667.1	667.8
Environmental Health Sciences (NIEHS)	641.8	642.3	642.9
Aging (NIA)	1,046.5	1,047.3	1,048.3
Arthritis/Musculoskeletal/Skin (NIAMS)	508.1	508.6	509.1
Deafness/Communication Disorders (NIDCD)	393.5	394.1	395.0
Nursing Research (NINR)	137.3	137.5	137.6
Alcohol Abuse/Alcoholism (NIAAA)	436.1	436.3	436.7
Drug Abuse (NIDA)	1,000.0	1,000.7	1,001.7
Mental Health (NIMH) ^e	1,403.6	1,405.5	1,406.8
Human Genome Research (NHGRI)	486.4	486.8	487.9
Biomedical Imaging/Bioengineering (NIBIB)	298.4	298.6	300.3
Research Resources (NCRR)	1,143.8	1,149.4	1,160.5
Complementary/Alternative Med (NCCAM)	121.4	121.6	121.7
Minority Health/Health Disparities (NCMHD)	199.4	199.6	199.8
Fogarty International Center (FIC)	66.4	66.6	66.6
National Library of Medicine (NLM)	319.8	320.5	323.0
Office of Director (OD) ^d	1,047.5	1,109.1	1,056.8
<i>Common Fund (non-add)</i>	(483.0)	(495.6)	(533.9)

Institutes and Centers (ICs)	FY2007 actual ^a	FY2008 enacted ^b	FY2009 request
Buildings & Facilities (B&F)	81.1	119.0	125.6
Subtotal, Labor/HHS Appropriation	28,899.3	29,229.5	29,229.5
Superfund (Interior approp to NIEHS) ^f	79.1	77.5	77.5
Total, NIH discretionary budget authority	28,978.5	29,307.1	29,307.1
Pre-appropriated Type 1 diabetes funds ^g	150.0	150.0	150.0
PHS Evaluation Tap funding ^h	8.2	8.2	8.2
Global Fund transfer (AIDS/TB/Malaria) ^c	-99.0	-294.8	-300.0
Total, NIH program level	29,037.7	29,170.5	29,165.3

Source: Adapted by CRS from NIH, *Justification of Estimates for Appropriations Committees, Fiscal Year 2009*, Tabular Data, p. TD-1, at [<http://officeofbudget.od.nih.gov/UI/2008/tabcular%20data.pdf>]. Details may not add to totals due to rounding.

- a. FY2007 reflects transfer of \$99.0 million from NIH to Office of the Secretary, per P.L. 110-28 (see note d). FY2007 also reflects comparative transfers to HHS (\$0.542m) and among NIH ICs.
- b. The FY2008 program level is an increase of \$132.8 million (0.5%) over FY2007. FY2008 includes comparative IC transfers from NHLBI to NIDDK (\$0.816 million) and from NLM to NIDCR (\$0.455 million).
- c. NIAID totals include funds for transfer to the Global Fund to Fight HIV/AIDS, TB, and Malaria.
- d. For FY2007, the emergency supplemental appropriations act (P.L. 110-28) transferred funding for the Advanced Development of Medical Countermeasures to Office of the Secretary (\$49.5m each from NIAID and OD).
- e. FY2008 NIMH has \$0.983m from Office of the Secretary to administer Interagency Autism Coordinating Committee.
- f. Separate account in the Interior/Environment appropriation for NIEHS research activities related to Superfund.
- g. Funds available to NIDDK for diabetes research under PHS Act § 330B (authorized by P.L. 106-554, P.L. 107-360, and P.L. 110-173).
- h. Additional funds for NLM from PHS Evaluation Set-Aside (§ 241 of PHS Act).

Department of Energy (DOE)

The Department of Energy (DOE) has requested \$10.535 billion for R&D in FY2009, including activities in three major categories: science, national security, and energy (see **Table 8**). This request is 6% above the FY2008 appropriation.

The request for the DOE Office of Science is \$4.722 billion, a 19% increase from FY2008. This unusually large increase reflects the American Competitiveness Initiative (ACI), which President Bush announced in the 2006 state of the union address. Over 10 years, the ACI would double R&D funding for the Office of Science and two other agencies.²¹ Congress set even faster growth targets in the America COMPETES Act (P.L. 110-69), establishing authorization levels that would double R&D funding for these agencies in seven years. The percentage increase in the President's FY2009 request for the Office of Science is higher than what would

²¹ The February 2006 White House document, *American Competitiveness Initiative: Leading the World in Innovation*, states that "ACI doubles total research fund; individual agency allocations remain to be determined." One or more of the ACI agencies may receive more or less than the amount required to double their FY2006 R&D level.

be required on an annual basis to reach the ACI doubling target. This was also the case in FY2007 and FY2008, but although the House and Senate bills for those years would have provided increases even relative to the request, the final appropriations were lower than the ACI amount.

Within the Office of Science, the request for basic energy sciences includes increases of \$153 million for a new program of Energy Frontier Research Centers, \$66 million for construction of the National Synchrotron Light Source II, and \$73 million to increase operating time at existing facilities. The requested 17% increase for high energy physics would go mostly to programs cut in the final FY2008 appropriation that had been funded in the House and Senate bills for that year. The requested 72% increase for fusion energy sciences would fund the U.S. contribution to the International Thermonuclear Experimental Reactor (ITER), which was eliminated in the final FY2008 appropriation, again despite support in the House and Senate bills for that year. In December 2007, DOE announced new estimates of the cost and schedule for ITER: between \$1.45 and \$2.2 billion (previously \$1.122 billion) with a completion date between FY2014 and FY2017 (previously FY2014).

The requested funding for DOE national security R&D is \$3.132 billion, a 2% decrease. Increases would include \$53 million for the naval reactors program, mostly to support processing and storage of spent nuclear fuel, and \$10 million for the reliable replacement warhead program, which Congress zeroed in the FY2008 appropriation. The major decrease would be \$79 million for proliferation detection R&D, a program that Congress increased in FY2008.

The request for DOE energy R&D is \$2.681 billion, down 2% from FY2008. Within this total, R&D on nuclear energy and coal would increase, while hydrogen R&D would decrease and gas and oil technology programs would be terminated (as also proposed, unsuccessfully, in other recent years). Most of the requested 17% decrease for energy efficiency and renewable energy results from the omission of \$186 million in FY2008 congressionally directed projects. The requested 44% increase for nuclear energy R&D would be mostly for the Advanced Fuel Cycle Initiative. **(CRS Contact: Daniel Morgan.)**

Table 8. Department of Energy R&D
(\$ in millions)

	FY2007	FY2008	FY2009 Request
Science	\$3,837	\$3,973	\$4,722
Basic Energy Sciences	1,222	1,270	1,568
High Energy Physics	732	689	805
Biological and Environmental Research	480	544	569
Nuclear Physics	412	433	510
Fusion Energy Sciences	312	287	493
Advanced Scientific Computing Research	276	351	369
Other	403	399	408
National Security	3,222	3,199	3,132
Weapons Activities ^a	2,154	2,016	1,996

	FY2007	FY2008	FY2009 Request
Naval Reactors	782	775	828
Nonproliferation and Verification R&D	265	387	275
Defense Environmental Cleanup TD&D	21	21	32
Energy	2,153	2,730	2,681
Energy Efficiency and Renewable Energy ^b	1,176	1,440	1,197
Fossil Energy R&D	581	743	754
Nuclear Energy R&D ^c	300	438	630
Electricity Delivery & Energy Reliability R&D	97	110	100
Total	9,212	9,903	10,535

Source: DOE FY2009 congressional budget justification.

- a. Includes Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Reliable Replacement Warhead, Science Campaigns, Engineering Campaigns except Enhanced Surety and Enhanced Surveillance, Inertial Confinement Fusion, Advanced Simulation and Computing, and a prorated share of Readiness in Technical Base and Facilities. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems, but these funds are not included in the table because detailed funding schedules for those subprograms are classified.
- b. Excludes Weatherization and Intergovernmental Activities.
- c. Includes Nuclear Power 2010, Generation IV Nuclear Energy Systems Initiative, Nuclear Hydrogen Initiative, and Advanced Fuel Cycle Initiative (AFCI). Note that AFCI funding appears in the Fuel Cycle Research and Facilities line item in FY2008, but in the Research and Development line item in FY2007 and FY2009.

National Science Foundation (NSF)

The FY2009 request for the National Science Foundation (NSF) is \$6.854 billion, a 13.6% increase (\$822.1 million) over the FY2008 estimate of \$6.032 billion (see **Table 9**). President Bush has proposed doubling the NSF budget over 10 years, from FY2007 to FY2016, as part of his American Competitiveness Initiative (ACI). The FY2009 request represents another installment toward that doubling effort. In August 2008, Congress passed the America COMPETES Act which authorizes funding for NSF for FY2008 through FY2010 at a pace that would more than double the agency's funding in seven years. NSF has identified several strategies in the FY2009 budget request: to maintain a portfolio with "powerful momentum" across all disciplines; to build a world-class science and engineering workforce; to perform effectively with the highest standards of accountability; and to support potentially transformative research. The NSF Director describes transformative research as "a range of endeavors, which promise extraordinary outcomes; such as, revolutionizing entire disciplines, creating entirely new fields, or disrupting accepted theories and perspective."²² Several reports have recommended that funds be allocated

²² Bement, Jr., Arden L., Director, National Science Foundation, "Transformative Research: The Artistry and Alchemy of the 21st Century," remarks, Texas Academy of Medicine, Engineering and Science Fourth Annual Conference, Austin, Texas, January 4, 2007. [http://www.nsf.gov/news/speeches/bement/07/alb070104_texas.jsp]

(continued...)

specifically for this type of research. NSF contends that in the global environment of science and engineering, support for transformative, high-risk, high-reward research is critical to U.S. competitiveness. These strategies parallel some of the goals contained in the President's ACI, and are designed to promote research that will drive innovation and support the design and development of world-class facilities, instrumentation, and infrastructure.

Included in the FY2009 request is \$5.594 billion for Research and Related Activities (R&RA), a 16.0% increase (\$772.5 million) above the FY2008 estimate of \$4.822 billion. R&RA funds research projects, research facilities, and education and training activities.

The scientific and academic communities have voiced concerns about the imbalance between support for the life sciences and the physical sciences. Research is multidisciplinary and transformational in nature, and very often, discoveries in the physical sciences lead to advances in other disciplines. The America COMPETES ACT authorizes increased federal research support in the physical sciences, mathematics, and engineering. The FY2009 request provides a 20.2% increase for the Mathematical and Physical Sciences (MPS) directorate. The MPS portfolio supports investments in fundamental research, facilities, and instruments, and provides approximately 44.0% of the federal funding for basic research in mathematics and physical sciences conducted at colleges and universities. R&RA includes Integrative Activities (IA), a cross-disciplinary research and education program, and is a source of funding for the acquisition and development of research instrumentation at institutions. The FY2009 request provides \$276.0 million for IA. The IA also funds Partnerships for Innovation, disaster research teams, and the Science and Technology Policy Institute. In FY2008, support for the Experimental Program to Stimulate Competitive Research (EPSCoR) was transferred from the Education and Human Resources Directorate (EHR) to IA. NSF's FY2009 request for EPSCoR is \$113.5 million, which is a part of the total IA funding request. The FY2009 request would support a portfolio of three complementary strategies — research infrastructure, co-funding, and outreach — for the 27 EPSCoR jurisdictions. Approximately 67.0% of the funding for EPSCoR would be used for a combination of new awards and research infrastructure improvement grants. The balance of funding would support co-funding (31.7%) and outreach activities (1.7%).

The NSF asserts that international research partnerships are critical to the nation in maintaining a competitive edge, addressing global issues, and capitalizing on global economic opportunities. The Administration has requested \$47.4 million for the Office of International Science and Engineering (OISE). The OISE manages NSF's offices in Beijing, Paris, and Tokyo that report on and analyze in-country and regional science and technology policies and developments. The OISE serves as a liaison with research institutes and foreign agencies, and facilitates coordination and implementation of NSF research and education efforts.

²² (...continued)

The Office of Polar Programs (OPP) is funded in the R&RA. The FY2009 request for addressing the challenges in polar research is \$491.0 million. NSF continues in its leadership role in planning U.S. participation in observance of the International Polar Year, 2007-2009.²³ The NSF also serves in a leadership capacity for several international research partnerships in the Arctic and Antarctic. Increases in OPP in FY2009 are directed at research programs for arctic and antarctic sciences — glacial and sea ice, terrestrial and marine ecosystems, the ocean and the atmosphere, and biology of life in the cold and dark. In FY2006, responsibility for funding the operational costs of three icebreakers that support scientific research in the polar regions was transferred from the U.S. Coast Guard to the NSF. NSF is responsible for the operation, maintenance, and staffing of the vessels. Beginning in FY2009, one of the icebreakers is to be in drydock. To meet the need for back-up icebreaking services, the FY2009 request includes an additional \$9.0 million for contracting of other vessels.

NSF supports several interagency R&D priorities in the FY2009 request. It is a lead agency in the U.S. nanotechnology research effort, accounting for \$396.8 million of the National Nanotechnology Initiative's \$1.53 billion FY2009 request. Funding would support research in emerging areas of nanoscale science and technology such as new drug delivery systems, advanced materials, more powerful computer chips. Support would be directed also at research and education in the environmental, health, and safety impacts of nanotechnology. NSF's other interagency priorities include funding for the Climate Change Science Program (\$220.6 million), Homeland Security (\$379.2 million), Networking and Information Technology R&D (\$1,090.3 million), and Climate Change Technology Program (\$23.5 million).

The NSF supports a variety of individual centers and center programs. The FY2009 request provides \$76.0 million for Science and Technology Centers, \$53.6 million for Materials Research Science and Engineering Centers, \$53.6 million for Engineering Research Centers, \$44.6 million for Nanoscale Science and Engineering Centers, \$15.0 million for Science of Learning Centers, \$20.0 million for Centers for Chemical Innovation, and \$18.4 million for Centers for Analysis and Synthesis.

The FY2009 request for the EHR Directorate is \$790.4 million, \$64.8 million (8.9%) above the FY2008 estimate. The EHR portfolio is focused on, among other things, increasing the technological literacy of all citizens; preparing the next generation of science, engineering, and mathematics professionals; and closing the achievement gap of underrepresented groups in all scientific fields. Support at the various educational levels in the FY2009 request is as follows: research on learning in formal and informal settings (including precollege), \$226.5 million; undergraduate, \$219.8 million; and graduate, \$190.7 million.

Priorities at the precollege level include research and evaluation on education in science and engineering (\$42.0 million), informal science education (\$66.0 million), and Discovery Research K-12 (\$108.5 million). Discovery Research is

²³ International Polar Year runs from March 2007 through March 2009. Sponsors say that a two-year period was selected to provide equal coverage of both the Arctic and Antarctic.

structured to combine the strengths of three existing programs and encourage innovative thinking in K-12 science, technology, engineering, and mathematics education.

According to NSF, programs at the undergraduate level are designed to “create leverage for institutional change.” Priorities at the undergraduate level include the Robert Noyce Scholarship Program (\$11.6 million); Course, Curriculum, and Laboratory Improvement (\$39.2 million); STEM Talent Expansion Program (\$29.7 million); Advanced Technological Education (\$51.6 million); and Scholarship for Service (\$15.0 million). The Math and Science Partnership Program (MSP), an interagency program, is proposed at \$51.0 million in the FY2009 request. The MSP in NSF coordinates activities with the Department of Education and its state-funded MSP sites. At the graduate level, NSF’s priorities are Integrative Graduate Education and Research Traineeship (\$25.0 million), Graduate Research Fellowships (\$116.7 million), and the Graduate Teaching Fellows in K-12 Education (\$49.0 million).

Additional priorities in the EHR would support a portfolio of programs directed at strengthening and expanding the participation of underrepresented groups and diverse institutions in the scientific and engineering enterprise. Among these targeted programs in the FY2009 request are the Historically Black Colleges and Universities Undergraduate Program (\$31.0 million), Tribal Colleges and Universities Program (\$13.4 million), Louis Stokes Alliances for Minority Participation (\$42.5 million), and Centers of Research Excellence in Science and Technology (\$30.5 million).

Improving the success rate of grant applicants has been a long-term priority for NSF. The funding rate (the number of grants awarded as a share of total grant applications) declined from 30% in FY2000 to an estimated 21% in FY2008. NSF anticipates increasing the funding rate to 23.0% in FY2009 by supporting an additional 1,370 research grants.

The Major Research Equipment and Facilities Construction (MREFC) account is funded at \$147.5 million in the FY2009 request, a decrease of 33.2% from the FY2008 estimate. The MREFC supports the acquisition and construction of major research facilities and equipment that extend the boundaries of science, engineering, and technology. According to NSF, it is the primary federal agency providing support for “forefront instrumentation and facilities for the academic research and education communities.” NSF’s first priority for funding is for ongoing projects. Second priority is given to projects that have been approved by the National Science Board for new starts. To qualify for support, NSF required MREFC projects to have “the potential to shift the paradigm in scientific understanding and/or infrastructure technology.” The FY2009 request is indicative of NSF’s tighter standards and requirements for receiving funding in this account. Three projects that appeared in the FY2008 request (Alaskan Regional Research Vessel, Ocean Observatories Initiative, and the National Ecological Observatory Network) have to undergo a final design review and a risk management plan to meet NSF’s policy of not allowing cost overruns on major facilities projects. These projects are still supported by NSF, and will be considered for inclusion in the budget cycle following submission of their revised baseline budgets and contingencies. The FY2009 request supports three ongoing projects: Advanced Laser Interferometer Gravitational Wave Observatory (\$51.4 million), Atacama Large Millimeter Array (\$82.3 million), and the IceCube

Neutrino Observatory (\$11.3 million). The request also provides \$2.5 million to support design activities for a new start, the Advanced Technology Solar Telescope. **(CRS Contact: Christine M. Matthews.)**

Table 9. National Science Foundation
(\$ in millions)

	FY2007 Actual	FY2008 Estimate	FY2009 Request
Research & Related Activities			
Biological Sciences	\$608.5	\$612.0	\$675.1
Computer & Inform. Sci. & Eng.	526.7	534.5	638.8
Engineering	630.0	636.9	759.3
Geosciences	745.9	752.7	848.7
Math and Physical Sciences	1,150.7	1,167.3	1,402.7
Social, Behav., & Econ. Sciences	214.5	215.1	233.5
Office of Cyberinfrastructure	182.4	185.3	220.1
Office of International Sci. & Eng.	40.4	41.3	47.4
U.S. Polar Programs	438.4	442.5	491.0
Integrative Activities ^a	219.5	232.3	276.0
U.S. Arctic Research Commission	1.5	1.5	1.5
Subtotal Res. & Rel. Act	4,758.4	4,821.5	5,594.0
Ed. & Hum. Resr.	695.7	725.6	790.4
Major Res. Equip. & Facil. Constr.	166.2	220.7	147.5
Agency Operations & Award Management.	248.5	281.8	305.1
National Science Board	3.7	4.0	4.0
Office of Inspector General	11.92	11.4	13.1
Rescission required under P.L. 110-161	—	-33.0	—
Total NSF March 20, 2008 ^b	5,884.4	6,032.0	6,854.1

a. Beginning in the FY2008 request, EPSCoR was transferred from the EHR Directorate to IA.

b. The totals do not include carry overs or retirement accruals. Totals may not add due to rounding.

Department of Commerce (DOC)

National Institute of Standards and Technology (NIST)

The National Institute of Standards and Technology (NIST) is a laboratory of the Department of Commerce with a mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of precompetitive, generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance techniques that

underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

For FY2009, the Administration's budget request would provide NIST with \$638.0 million, 15.6% below the current fiscal year due primarily to the absence of funding for the Technology Innovation Program (TIP) and a significant reduction in support for the Manufacturing Extension Partnership (MEP) program. Internal research and development under the Scientific and Technology Research and Services (STRS) account is to increase 21.5% to \$535.0 million (including \$8.5 million for the Baldrige National Quality Program). The MEP program is to receive \$4 million to close out the federally funded portion of the activity such that "...MEP centers will become independent, as intended in the program's original authorization." This figure is over 95% less than the FY2008 appropriation. Construction funding would decrease 38.3% to \$99.0 million. (See **Table 10**.)

The FY2008 Consolidated Appropriations Act, P.L. 110-161, finances NIST at \$755.8 million, an increase of 11.7% over FY2007. Support for the STRS account increased 1.4% to \$440.5 million (including \$7.9 million for the Baldrige Quality Program). The Technology Innovation Program (formerly the Advanced Technology Program (ATP)) was appropriated \$65.2 million (with an additional \$5 million from FY2007 unobligated balances under ATP), 17.6% below the previous fiscal year. Funding for MEP decreased 14.4% to \$89.6 million. Support for construction almost tripled to \$160.5 million.

The President's FY2008 budget proposal requested \$640.7 million for NIST, 5.3% below the FY2007 appropriation. The STRS account would have increased 15.2% to \$500.5 million (including the Baldrige Quality Program). There was no funding for ATP and financing for MEP would have been reduced 55.8% to \$46.3 million. Construction expenses were to increase 60% to \$93.9 million.

No final FY2007 appropriations legislation for NIST was enacted during the 109th Congress. A series of continuing resolutions funded the program at FY2006 levels through February 15, 2007. However, P.L. 110-5, passed in the 110th Congress, provided \$676.9 million in FY2007 support for NIST. Funding for the STRS account increased 10% over the previous fiscal year to \$434.4 million while the construction budget decreased 66% to \$58.7 million. Financing for ATP at \$79.1 million and support for MEP at \$104.7 million reflected similar funding in FY2006.

As part of the American Competitiveness Initiative, the Administration stated its intention to double over 10 years funding for "innovation-enabling research" performed at NIST through its "core" programs (defined as internal research in the STRS account and the construction budget). To this end, the President's FY2007 budget requested an increase of 18.3% for intramural R&D at NIST; FY2007 appropriations for these in-house programs increased 9.6%. For FY2008, the omnibus appropriations legislation provided for a small increase in the STRS account. This is in contrast to the Administration's FY2008 budget which included a 15.2% increase in funding, as did the original appropriations bill, H.R. 3093, as passed by the House, while the Senate-passed version contained a 15.6% increase. The President's FY2009 budget request proposes a 21.5% increase in support for the STRS account.

Continued support for the Advanced Technology Program was a major funding issue, particularly because opponents objected to large companies receiving research grants. Although Congress maintained (often decreasing) funding for ATP, the initial appropriation bills passed by the House since FY2002 failed to include financing for the program. In FY2006, support for the program was cut 41% and in FY2007, P.L. 110-69 replaced ATP with the Technology Innovation Program which focuses on small and medium sized firms. The Consolidated Appropriations Act, FY2008, provides funding for this new initiative. The Administration's FY2009 budget request does not include financing for TIP. The budget for the Manufacturing Extension Partnership, another extramural program administered by NIST, has also been debated for several years. The President's FY2009 budget proposal recommends curtailing the federally funded portion of the MEP and provides \$4.0 million to accomplish this objective.

For additional information, see CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*; CRS Report RS22815, *The Technology Innovation Program*; and CRS Report 97-104, *The Manufacturing Extension Partnership Program: An Overview*, all by Wendy H. Schacht. (CRS Contact: Wendy H. Schacht.)

Table 10. NIST
(\$ in millions)

NIST Program	FY2007	FY2008 Request	FY2008	FY2009 Request
STRS ^a	\$434.4	\$500.5	440.5	535.0
ATP/TIP	79.1	0	65.2 ^c	0
MEP	104.7	46.3	89.6	4.0
Construction	58.7	93.9	160.5	99.0
NIST Total	676.9	640.7	755.8	638.0

Note: Figures may not add up because of rounding.

a. Includes funding for the Baldrige National Quality Program

b. Does not include the \$30.8 million directed away from the ATP appropriation for use by other non-NIST programs

c. Funding is for the new Technology Innovation Program (TIP) that replaces ATP.

National Oceanic and Atmospheric Administration (NOAA)

President Bush has proposed \$576 million in NOAA R&D funding for FY2009 (see **Table 11**), or about 14% of the agency's total discretionary budget request of \$4.109 billion. The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), released a *NOAA FY2009 Budget Summary*, on February 4, 2008, detailing the NOAA request. As reported, the R&D request would consist of 93% research funding and 7% development funding. About 70% of the R&D request would account for intramural programs, while 30% would be for extramural ones.

NOAA's Budget Office reported the R&D funding request for the Office of Oceanic and Atmospheric Research (OAR) to be \$294 million, or 51% of total R&D funding requested for FY2009. NOAA R&D request figures indicate that there would be an increase of 38% for the National Ocean Service (NOS) and one of 24% for the National Marine Fisheries Service (NMFS). These line offices in general sustained overall budget cuts affecting R&D for FY2008. The National Environmental Satellite Data and Information Service (NESDIS) R&D budget request is a slight increase of \$2 million as compared with the FY2008 enacted appropriation. National Weather Service (NWS) R&D is essentially flat funded at \$23 million. The President's budget for FY2009 indicated that \$260 million of NOAA's budget request would be for the U.S. Climate Change Science Program (CCSP). Also, it indicated that \$378 million requested for OAR represents NOAA's portion of the President's "Federal Science and Technology Budget" for FY2009. **(CRS Contact: Wayne Morrissey.)**

Table 11. NOAA R&D
(\$ in millions)

R&D By NOAA Line Office and Program Support	FY2007 Actual ^a	FY2008 Enacted ^b	FY2009 Request
National Ocean Service (NOS)	62	57	55
National Marine Fisheries Service (NMFS)	47	45	50
Oceanic and Atmospheric Research (OAR)	299	323	293
National Weather Service (NWS)	23	23	23
National Environmental Satellite Data and Information Service (NESDIS)	30	26	29
Office of Marine and Aviation Services (OMAO) — Program Support	97	107	126
Total Conduct of R&D	\$557	\$581	\$576

Source: Department of Commerce, National Oceanic and Atmospheric Administration, NOAA, "FY2007-FY2009, Research and Development," personal communication, March 13, 2008.

a. P.L. 110-5 (Reported as H.J.Res. 20)

b. P.L. 110-161 (Reported as Amendment to the Senate Amendment to H.R. 2764, the Consolidated Appropriations Act of 2008, Div. B, Title I, Commerce, Justice, Science and Related Agencies

c. OMAO R&D includes marine research data acquisition and services.

National Aeronautics and Space Administration (NASA)

President Bush has requested \$12.9 billion for NASA R&D in FY2009 (see **Table 12**). This request is a 5% increase over FY2008, in a total NASA budget that would increase by 2%.

Budget priorities throughout NASA are being driven by the Vision for Space Exploration. Announced by President Bush in January 2004 and endorsed by

Congress in the NASA Authorization Act of 2005 (P.L. 109-155), the Vision includes returning the space shuttle to regular flight status following the 2003 *Columbia* disaster, but then retiring it by 2010; completing the International Space Station, but discontinuing its use by the United States by 2017; returning humans to the Moon by 2020; and then sending humans to Mars and “worlds beyond.” To replace the space shuttle and carry astronauts to the Moon, NASA is developing a new spacecraft and a new launch vehicle, known as Orion and Ares I. Their first crewed flight is expected in March 2015.

In general, the FY2009 request includes increases for programs related to the Vision and decreases for other programs. The request for Constellation Systems, the program responsible for developing Orion and Ares I, is an increase of \$576 million or 23% relative to FY2008. The request for the International Space Station is an increase of \$247 million or 14%. Among programs not focused on human space exploration, the request for Science is a decrease of \$15 million or 0.3%,²⁴ and the request for Aeronautics is a decrease of \$65 million or 13%.

Within the nearly flat request for Science, increases for Earth Science and Planetary Science would be offset by a decrease for Astrophysics. The request for Earth Science would fund two new missions recommended by the National Research Council,²⁵ while the request for Planetary Science would initiate a new program in lunar robotic science. In Astrophysics, two programs have been of particular congressional interest: the NASA/DOE Joint Dark Energy Mission (JDEM) and the Space Interferometer Mission (SIM). The request includes funds for JDEM, as directed by Congress in the FY2008 explanatory statement,²⁶ but not for SIM. NASA explains that a new exoplanet exploration initiative could include a smaller, medium-class version of SIM, as recommended by the FY2008 Senate report.²⁷

(CRS Contact: Daniel Morgan.)

²⁴ After adjusting for transfers. See notes to **Table 12**.

²⁵ National Research Council, *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, 2007.

²⁶ *Congressional Record*, December 17, 2007, pp. H15820 and H15923.

²⁷ S.Rept. 110-124, p. 110.

Table 12. NASA R&D
(\$ in millions)

	FY2007 ^a	FY2008 ^a	FY2009 Request
Science ^b	\$4,363	\$4,456	\$4,442
<i>Earth Science</i>	1,198	1,280	1,368
<i>Planetary Science</i>	1,216	1,248	1,334
<i>Astrophysics</i>	1,365	1,338	1,162
<i>Heliophysics</i> ^b	584	591	577
Aeronautics	594	512	446
Exploration	2,870	3,143	3,500
<i>Constellation Systems</i>	2,115	2,472	3,048
<i>Advanced Capabilities</i>	755	671	452
International Space Station	1,469	1,813	2,060
Subtotal R&D	9,295	9,924	10,449
Other NASA Programs ^c	4,040	4,142	3,866
Cross-Agency Support ^d	2,950	3,243	3,300
<i>Associated with R&D</i>	2,056	2,288	2,409
<i>Associated with Other Programs</i>	894	955	891
Total R&D	11,352	12,212	12,857
Total NASA	16,285	17,309	17,614

Source: NASA FY2009 budget justification ([<http://www.nasa.gov/news/budget/>]).

- a. Adjusted for accounting changes to be comparable with the FY2009 request.
- b. Reduced by \$247 million in FY2007 and \$250 million in FY2008 to adjust for the transfer of Near Earth Networks and Deep Space Mission Systems from Heliophysics to Space and Flight Support in FY2009.
- c. Space Shuttle, Space and Flight Support (increased as in note b), Education, and Inspector General.
- d. Allocation between R&D and non-R&D estimated by CRS in proportion to the underlying program amounts in order to allow calculation of a total for R&D. The Cross-Agency Support account consists mostly of indirect costs for other programs assessed in proportion to their direct costs.

Department of Agriculture (USDA)

The FY2009 R&D request for the U.S. Department of Agriculture (USDA) is \$2.333 billion, a 13.0% decrease (\$347.8 million) from the FY2008 estimate of \$2.680 billion (see **Table 13**). The Agricultural Research Service (ARS) is USDA's in-house basic and applied research agency, and operates approximately 100 laboratories nationwide. The ARS laboratories focus on efficient food and fiber production, development of new products and uses for agricultural commodities, development of effective biocontrols for pest management, and support of USDA

regulatory and technical assistance programs. Included in the total support for USDA in FY2009 is \$1.067 billion for ARS, \$117.2 million below the FY2008 estimate. In the ARS, the Administration proposes the reduction of \$41.0 million in funding add-ons designated by Congress for research at specific locations. Also, there is the proposed discontinuation and redirection of \$105.0 million in lower priority programs. The amounts are to be redirected to critical research priorities of the Administration that include livestock production, food safety, crop protection, and human nutrition. Included in the FY2009 request for ARS is \$13.2 million for buildings and facilities.

The Cooperative State Research, Education, and Extension Service (CSREES) distributes funds to State Agricultural Experiment Stations, State Cooperative Extension Systems, land-grant universities, and other institutions and organizations that conduct agricultural research, education, and outreach. Included in these partnerships is funding for research at 1862 land-grant institutions, 1890 historically black colleges and universities, and 1994 tribal land-grant colleges. Funding is distributed to the states through competitive awards, statutory formula funding, and special grants. The FY2009 request provides \$1.010 billion for CSREES, a decrease of \$189.1 million from the FY2008 estimate. The CSREES FY2009 budget includes the proposed elimination of \$144.0 million in Congressional add-ons and the reduction of \$88.0 million in lower priority programs. Funding for formula distribution in FY2009 to the state Agricultural Experiment Stations is \$273.2 million, approximately \$1.5 million below the FY2008 estimate. Support for the 1890 formula programs is \$38.3 million, \$2.8 million below the FY2008 level. One of the primary goals of the FY2009 CSREES budget is to expand competitive, peer-reviewed allocation of research programs. The FY2009 budget request has proposed, as in previous years, to modify the Hatch formula program.²⁸ It would expand the multistate research programs share of Hatch funds from 25.0% to approximately 70.0%. The request would redirect 42.0% of Hatch funds to nationally, competitively awarded, multi-state/multi-institutional projects in the first year, with the balance of funds distributed over a four year period. In addition, the FY2009 request proposes allocating 67.0% of McIntire-Stennis funds for the creation of a competitively awarded multi-state research program. The extension programs are also proposed to be strengthened through competitively awarded grants. The programs are designed to be more responsive to critical national issues such as agricultural security, local and regional emergencies, zoonotic diseases, and pest risk management.

The FY2009 request proposes \$256.5 million for the National Research Initiative (NRI) Competitive Grants Program, an increase of \$65.6 million over the FY2008 estimate. In addition to supporting fundamental and applied science in agriculture, USDA maintains that the NRI makes a significant contribution to developing the next generation of agricultural scientists by providing graduate students with opportunities to work on research projects. A focus of these efforts is

²⁸ Hatch Act Formula grants are provided for agricultural research to state agricultural experiment stations (SAES) in accordance with the act approved July 2, 1862 (7 U.S.C. 301 et seq.) — as amended through P.L. 107-293. SAESs are directed to support research projects that have relevance to the special needs of the respective states. SAESs are required to provide 100% in matching funds.

providing increased opportunities for minority and under-served communities in agricultural science. NRI funding also will support projects directed at developing alternate methods of biological and chemical conversion of biomass, and research determining the impact of a renewable fuels industry on the economic and social dynamics of rural communities. The Administration has proposed support for initiatives in agricultural genomics, emerging issues in food and agricultural security, the ecology and economics of biological invasions, and plant biotechnology. Research is proposed that moves beyond water quality issues to extend to water availability, reuse, and conservation.

The FY2009 request for USDA provides \$82.1 million for the Economic Research Service (ERS), \$4.2 million above the FY2008 estimated level; and \$153.5 million for the National Agricultural Statistics Service (NASS), approximately \$9.9 million below the FY2008 level. The budget includes support to improve research efforts in analyzing the impacts of bioenergy production, and to examine those concerns pertaining to feedstock storage, transportation networks, and the vagaries in commodity production. Funding for NASS will allow for the creation of a data series on key elements of bioenergy production. Research areas to explore include production and utilization of biomass materials; stocks and prices of distillers' grains; and current and proposed ethanol plants. Funding is provided in the NASS FY2009 request to fully fund the last year of the 2007 Census of Agriculture. Funding will be available also for data collection to measure energy use and production on farms. (CRS Contact: **Christine M. Matthews.**)

Table 13. U.S. Department of Agriculture R&D
(\$ in millions)

	FY2007 Actual ^a	FY2008 Estimate	FY2009 Request ^a
Agricultural Research Service (ARS)			
Product Quality/Value Added	\$105.4	\$105.1	\$97.6
Livestock Production	85.1	84.8	70.1
Crop Production	201.2	200.6	191.0
Food Safety	104.7	104.5	105.8
Livestock Protection	86.8	82.4	68.8
Crop Protection	197.0	196.0	188.7
Human Nutrition	85.7	85.3	79.5
Environmental Stewardship	223.2	222.5	199.6
National Agricultural Library	23.7	21.8	18.4
Repair and Maintenance	17.6	17.5	17.5
Subtotal	1,147.2 ^b	1,120.6	1,037.0
Buildings and Facilities	0.0	46.8	13.2
Trust Funds	16.0	17.0	17.0
Total, ARS	1,163.2 ^c	1,184.4	1,067.2
Cooperative State Research, Education, & Extension (CSREES) Research and Education			
Hatch Act Formula	322.6	195.8	139.2
Cooperative Forestry Research	30.0	24.8	19.5
Evans-Allen Formula (Payments to 1890)	40.7	41.1	38.3
Special Research Grants	14.7	107.1	18.1

	FY2007 Actual ^a	FY2008 Estimate	FY2009 Request ^a
NRI Competitive Grants	190.2	190.9	256.5
Animal Health and Disease Res.	5.0	5.0	0.0
Federal Administration	10.3	42.2	10.7
Higher Education ^d	52.2	53.9	54.6
Integrated Activities	55.2	55.9	20.1
Outreach for Disadvantaged Farmers	5.9	6.4	6.9
Other Programs	21.0	22.6	14.0
Total, Cooperative Research. & Education ^c	747.8	745.7	577.9
Extension Activities			
Smith-Lever Sections 3b&c	285.6	274.7	273.2
Smith-Lever Sections 3d	94.5	97.5	91.5
Renewable Resources Extension	4.0	4.0	4.1
1890 Colleges, Tuskegee, & West Virginia State	16.8	17.3	16.6
Other Extension Prog. & Admin.	49.4	59.7	46.4
Total, Extension Activities	450.3	453.2	431.8
Total, CSREES ^e	1,198.2	1,198.8	1,009.7
Economic Research Service	75.2	77.9	82.1
National Agricultural Statistics Service	147.3	163.4	153.5
Total, Research, Education, and Economics	2,639.1	2,680.4	2,332.6

Note: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas — FY2007, \$35.7 million; FY2008, \$35.5 million; and FY2009, \$64.3 million.

- a. Funding levels are contained in U.S. Department of Agriculture FY2009 Budget Summary and other documents internal to the agency.
- b. Includes funds for the Collaborative Research Program (\$3.0 million), Miscellaneous Fees (\$8.7 million), and an unobligated balance (\$5.2 million)
- c. Includes an unobligated balance of \$5.2 million.
- d. Higher education includes payments to 1994 institutions and 1890 Capacity Building Grants program, the Native American Institutions Endowment Fund, the Alaska Native and Native Hawaiian-Serving Institutions Education Grants, and others.
- e. Program totals may or may not include set-asides (non-add) or contingencies. The CSREES total includes support for Community Food Projects and the Organic Agriculture Research and Education Initiative.

Department of the Interior (DOI)

President Bush has requested \$617 million for Department of the Interior (DOI) R&D in FY2009, an estimated decrease of 8.7% from FY2008 funding of \$676 million (see **Table 14**). The U.S. Geological Survey (USGS) is the primary supporter of R&D within DOI, accounting for nearly 90% of the department's total R&D appropriations. President Bush has proposed \$546 million for USGS R&D in FY2009, a reduction of \$40.6 million (-6.9%) from the estimated FY2008 level. FY2009 R&D funding would decline in three of the four USGS research divisions: Geographic Research, Geological Resources, and Water Resources. FY2009 funding for the Biological Research Division would remain flat. Funding for a new USGS program, Global Change, was authorized by Congress in FY2008 and funded at \$7.4

million. The President's FY2009 budget proposes a 260.1% increase in funding for this program to \$26.6 million.

USGS Geographic Research efforts seek to describe and interpret America's landscape by mapping the nation's terrain, monitoring changes over time, and analyzing how and why these changes have occurred. The President's FY2009 budget for Geographic Research R&D proposes a \$5.6 million cut (-11.8%) to \$41.9 million from its estimated FY2008 level of \$47.5 million.

Funding for Geological Resources R&D in FY2009 would decrease by \$33.4 million (-15.2 percent) to \$185.5 million from its estimated FY2008 level of \$218.8 million. The Geological Resources Program assesses the availability and quality of the nation's energy and mineral resources. The Geological Resources Program researches, monitors, and assesses the landscape to understand geological processes to help distinguish natural change from those resulting from human activity. Within the earth sciences, the USGS plays a major role in important geological hazards research, including research on earthquakes and volcanoes. Enterprise Information conducts information science research to enhance the National Map and National Spatial Data infrastructure.

USGS Water Resources R&D is focused on water availability, water quality and flood hazards. The President's FY2009 budget for Water Resources R&D proposes a \$21.4 million cut (-16.7%) to \$106.7 million from its estimated FY2008 level of \$128.1 million.

USGS Biological Research efforts seek to generate and distribute scientific information that can assist in the conservation and management of the nation's biological resources. The President's FY2009 budget request for Biological Research R&D proposes a small increase of \$0.5 million (less than 1%) to \$180.3 million. The USGS Biological Research program serves as DOI's biological research arm, using the capabilities of 17 research centers and associated field stations, one technology center, and 40 cooperative research units that support research on fish, wildlife, and natural habitats. Major research initiatives are carried out by USGS scientists who collect scientific information through research, inventory, and monitoring investigations. These activities develop new methods and techniques to identify, observe, and manage fish and wildlife, including invasive species and their habitats.

(CRS Contact: John Sargent.)

Table 14. Department of the Interior R&D
(\$ in millions)

	FY2007 actual	FY2008 estimate	FY2009 request
Geographic Research	44	47	42
Geological Resources	218	219	185
Water Resources	126	128	107
Biological Research	181	180	180
Global Change	0	7	27
Enterprise Information	5	5	5
USGS total	574	586	546
Other agencies ^a	77	84	82
Total ^b	651	671	628

Source: R&D estimates are from the Department of the Interior's FY2009 agency budget justification, except for FY2007 funding data for the Bureau of Reclamation (incorporated in "Other agencies") which is from data in the Department of the Interior's FY2008 budget justification. [<http://www.doi.gov/budget>]

- a. Includes the Bureau of Reclamation, the Bureau of Land Management, the Minerals Management Service, and the National Park Service.
- b. Totals may not add due to rounding.

Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA), the regulatory agency responsible for carrying out a number of environmental pollution control laws, funds a broad portfolio of R&D activities to provide the necessary scientific tools and knowledge to support decisions relating to preventing, regulating, and abating environmental pollution. Most of EPA's scientific research activities are funded within the agency's Science and Technology (S&T) appropriations account. This account is funded by a "base" appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account. These transferred funds are dedicated to research on more effective methods to clean up contaminated sites. Including the transfer from the Superfund account, the President's FY2009 budget request includes \$789.9 million for the S&T account, a \$4.1 million (less than 1%) increase above the FY2008 appropriation of \$785.8 million (see **Table 15**). The total amount requested for the S&T account represents 11% of the \$7.14 billion requested for EPA for FY2009.

Without adjusting for inflation, requested FY2009 funding for certain research activities would increase relative to FY2008 appropriated levels; however, funding for many of the program areas within the S&T account would remain relatively constant or decline. For example, the request includes decreased funding for

“Climate Change Protection Program” and “Global Change Research,” but an increase for “Air Toxics and Quality” programs. Overall funding for “Human Health and Ecosystem Research,” including funding for the Science to Achieve Results (STAR) program, would decrease based on the FY2009 request. However, within this category, funding for human health “Computational Toxicology Research” would increase. The largest requested increase for FY2009 within the S&T account is for two EPA homeland security activities: Water Security Initiative, and Decontamination Research.²⁹ The combined \$51.4 million requested for FY2009 is \$19.3 million above the FY2008 appropriation of \$32.1 million for these two activities; a 60% increase.

Although the Office of Management and Budget (OMB) reports³⁰ historical and projected budget authority amounts for R&D at EPA (and other federal agencies), OMB documents do not describe how these amounts explicitly relate to the requested and appropriated funding amounts for the many specific EPA program activities. EPA’s annual appropriations are requested, considered, and enacted according to eight line-item appropriations accounts, which were established by Congress.

The activities funded within the Science and Technology (S&T) account include research conducted by universities, foundations, and other non-federal entities with grants awarded by EPA, and research conducted by the agency at its own laboratories and facilities. R&D at EPA headquarters and laboratories around the country, as well as external R&D, is managed primarily by EPA’s Office of Research and Development (ORD). A large portion of the S&T account appropriations fund EPA’s R&D activities managed by ORD, including the agency’s research laboratories and research grants. The account also provides funding for the agency’s applied science and technology activities conducted through its program offices (e.g., the Office of Water). Many of the programs implemented by other offices within EPA have a research component, but the research is not necessarily the primary focus of the program.

The operation and administration of the agency’s laboratories and facilities necessitate significant expenditures for rent, utilities, and security. Prior to FY2007, a significant portion of the funding for these expenses had been requested and appropriated within EPA’s Environmental Programs and Management (EPM)

²⁹ Under the Bioterrorism Act of 2002, and Homeland Security Presidential Directives 7, 9 and 10, EPA is the lead federal agency for coordinating security of the Nation’s water systems, and plays a role in developing early warning monitoring and decontamination capabilities associated with potential attacks using biological contaminants.

³⁰ The Office of Management and Budget (OMB) reports R&D budget authority amounts in its Analytical Perspectives accompanying the annual President’s budget, but amounts for specific programs are not included. The R&D budget authority amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T account, but the differences are not explicitly defined. For example, for EPA R&D OMB reported actual budget authority of \$606 million for FY2007, an estimated amount of \$557 million for FY2008, and \$550 million proposed for FY2009. See OMB, *Fiscal Year 2009 Budget of the United States: Analytical Perspectives - Cross Cutting Programs*.

[<http://www.whitehouse.gov/omb/budget/fy2009/>]

appropriations account. In FY2007, and FY2008, increasing portions of funding for these expenses were requested and appropriated within the S&T account. As **Table 15** illustrates, this change affects comparisons of the S&T appropriations over time. Funding for these latter expenses represents approximately 10% of the total S&T account in the FY2009 request and the FY2008 appropriations, compared to less than 5% in FY2007.³¹

Some Members of Congress and an array of stakeholders have continually raised concerns about the adequacy of funding for scientific research at EPA. The adequacy of funding for EPA's scientific research activities has been part of a broader question about the adequacy of overall federal funding for a broad range of scientific research activities administered by multiple federal agencies. Some Members of Congress, scientists, and environmental organizations have expressed concern about the downward trend in federal resources for scientific research over time. The debate continues to center around the question of whether the regulatory actions of federal agencies are based on "sound science," and how scientific research is applied in developing federal policy. (CRS Contact: Robert Esworthy).

Table 15. Environmental Protection Agency S&T Account
(\$ in millions)

Environmental Protection Agency	FY2007 Enacted	FY2008 Enacted	FY2009 Requested
Science and Technology Appropriations Account			
— <i>Base Appropriations</i>	\$733.4	\$760.1	\$763.5
— <i>Transfer in from Superfund Account</i>	30.2	25.7	26.4
Science and Technology Total	763.6	785.8	789.9
— <i>(Operations and Administration)</i>	(33.0)	(72.7)	(74.9)
Net Science and Technology	730.6	713.1	715.0

Source: Prepared by the Congressional Research Service (CRS) using information provided by the House Appropriations Committee. Enacted amounts for FY2008 in the above table reflect a 1.56 % across-the-board rescission required in P.L. 110-161 for any discretionary appropriations in Division F Titles I through IV of the law (Division F Title IV § 437 of P.L. 110-161). Numbers may not add due to rounding.

Department of Transportation (DOT)

President Bush has requested \$901 million for Department of Transportation (DOT) R&D in FY2009, an increase of approximately \$78 million (9.5%) from FY2008 funding of \$823 million (see **Table 16**). In addition to receiving R&D funds through the regular appropriations process, DOT also receives R&D funding from

³¹ For example, for research alone (net after operations and administration expenses), the FY2008 consolidated appropriations provided a \$6.4 million increase above the FY2008 request for the S&T account, but \$17.5 million less than the FY2007 appropriations (includes transfers from the Superfund account).

the Transportation Trust Fund through authorization legislation.³² For example, P.L. 109-59, the Safe, Accountable, Flexible, Efficient Transportation Equity Act — A Legacy for Users, which became law in August 2005, set DOT surface transportation authorization levels for each fiscal year from FY2005 through FY2009, providing increased DOT R&D funding during this period.

The Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA) together account for more than 80 percent of DOT's R&D funding request. FHWA, FAA and the Federal Transit Administration (FTA) account for all increases in the DOT FY2009 R&D budget request.

The President has requested \$392.8 million in FY2009 for FHWA R&D, an increase of \$20.1 million (5.4%) above the FY2008 funding level of \$372.6 million. FHWA's research programs include the investigation of ways to improve safety, reduce congestion, improve mobility, reduce lifecycle construction and maintenance costs, improve the durability and longevity of highway pavements and structures, enhance the cost-effectiveness of highway infrastructure investments, and minimize negative impacts on the natural and human environment.

FHWA's FY2009 budget would provide \$166.9 million for R&D under the Surface Transportation Research, Development, and Deployment Program, an increase of \$23 million (16%) above the FY2008 level of \$143.9 million, and \$51.3 million for R&D for the Intelligent Transportation Systems program, an increase of \$7.5 million (17%) above the FY2008 level of \$43.8 million. These increases are partially offset by decreases in R&D funds for State Planning and Research (down \$10.7 million, -6.4%) which would receive \$156.2 million in FY2009.

The President has requested \$335.0 million for Federal Aviation Administration (FAA) R&D, up \$64.2 million (23.2%) from the FY2008 level of \$270.7 million. The request includes \$171.0 million for Research, Engineering, and Development, \$161.5 million for the Air Traffic Organization (ATO), \$2.3 million for Safety and Operations, and \$125,000 for Commercial Space Transportation. The request includes an increase in R&D funding for FAA's Next Generation Air Transportation System (NextGen) which is focused on addressing air traffic growth by increasing the nation's airspace capacity and efficiency and reducing emissions and noise. NextGen R&D funding under Research, Engineering, and Development increases from \$24.3 million in FY2008 to \$56.5 million in FY2009, up \$32.2 million (132.5%). An additional \$69.4 million is requested for NextGen R&D under ATO focused on systems development, demonstrations and infrastructure development.

The President's FY2009 budget proposes \$16.8 million in R&D funding for the Federal Transit Administration (FTA), up \$4.9 million over the FY2008 level of \$11.9 million. (**CRS Contact: John Sargent.**)

³² Appropriators may add to or direct funds identified in authorization legislation.

Table 16. Department of Transportation R&D
(\$ in millions)

Department of Transportation	FY2007 actual	FY2008 estimated	FY2009 request
Federal Highway Administration	371	373	393
Federal Aviation Administration	232	271	334
Other agencies ^a	165	179	174
Total	768	823	901

Source: R&D estimates are from unpublished OMB tables and DOT budget justifications.

a. “Other agencies” includes National Highway Traffic Safety Administration, Federal Railroad Administration, Federal Transit Administration, Research and Innovative Technology Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and the Office of the Secretary.